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CASE REPORT

Positive Outcome Following Unsuccessful Subintimal Angioplasty

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Introduction

Attempted recanalisation of femoral artery occlusions in two patients using the subintimal route were initially technically unsuccessful. In both cases, it was possible to pass the occluded segment but re-entry into the lumen of the vessel with the guidewire–catheter combination was not achieved. Follow-up in both cases demonstrated spontaneous formation of passages between the iatrogenically formed subintimal channels and the true vessel lumens. Clinical improvement following failed subintimal angioplasty has been previously noted in a few cases[1]; however, spontaneous recanalisation in the follow-up period has not previously been reported.

Case 1

A 76-year-old widowed lady presented to the vascular clinic with a 6-month history of bilateral calf claudication at 50 yards. She had a past medical history of cerebrovascular accident, subacute bacterial endocarditis, chronic airways limitation and congestive cardiac failure. Echocardiography showed a moderate reduction in left ventricular function. A long-term smoker, she continued to smoke five cigarettes per day. Examination revealed no peripheral leg pulses and duplex ultrasound, performed at the first attendance, showed good inflow to the common femoral arteries bilaterally. In the right leg there was severe, diffuse and calcified atheromatous narrowing of the superficial femoral artery (SFA) within the adductor canal. The anterior (AT) and posterior tibial (PT) arteries were patent to the foot. The left SFA was occluded from its origin to the popliteal artery (PA) which showed some diffuse narrowing. Run-off to the foot was via the AT and peroneal arteries. She was booked for elective angioplasty; however, prior to this her claudication had worsened to 10 yards and she developed bilateral nocturnal rest pain. Clinical examination at this time revealed evidence of chronic ischaemia with positive Buergers tests. Angiography at this time showed bilateral full length SFA occlusions. Following a bolus of 2500 IU of intra-arterial heparin the right SFA occlusion was successfully angioplastied subintimally using a 5 mm balloon. An antegrade puncture was then made into the left common femoral artery. A further 2500 IU of heparin were given and an 0.035 inch guidewire was passed across the SFA occlusion within the subintimal space; however, due to extensive calcification in the vessel, it was not possible to follow the wire with a predilating catheter. The channel was, therefore, dilated using a 5 mm balloon catheter to just distal to the occlusion. Contrast introduced to check catheter position now showed extension of the dissected channel into the calf vessels with no discernible flow into the foot (Figs 1a, 1b and 1c). Attempts to re-enter the true lumen in the distal vessel were unsuccessful. The procedure was therefore abandoned. Immediately following the procedure there was clinical evidence of foot ischaemia; however this improved and duplex ultrasound performed the following morning showed good flow in the SFA, AT and peroneal artery down to the ankle and into the foot. She was discharged home and follow-up in the

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Fig. 1. Digitally subtracted left femoral arteriogram showing subintimal dissection in the superficial femoral artery which contains an eccentric intraluminal plaque (a) and popliteal artery (b). The intimal flap can be clearly seen. Extension of the dissection into the crural vessels occurred spontaneously and there is no discernible flow of contrast into the distal calf vessels (c).

clinic at 1 and 8 months revealed her to have improved exercise tolerance, palpable distal pulses and a negative Buergers test.

Case 2

A 75-year-old lady was admitted for elective angioplasty for right-sided claudication at 400 yards. There was a past medical history of hysterectomy, partial thyroidectomy, myocardial infarction, angina, and macular degeneration. On examination there were normal pulses palpable on the left but non-palpable leg pulses below the femoral on the right. A walk test showed reduced right ankle pressures at rest with an ankle–brachial pressure index (ABI) of 0.78 falling to 0.24 following exercise. A duplex ultrasound showed normal triphasic inflow to the right common femoral artery, diffuse atheroma in the proximal SFA and a 10 cm occlusion in the adductor canal which is seen

Fig. 2. Digitally subtracted right femoral arteriogram in "road map" mode showing an occlusion of the superficial femoral artery in the adductor canal.

Fig. 3. The occluded segment (in the upper half of the figure) has been passed by the wire/catheter combination. The early venous filling seen is a useful feature in confirmation of subintimal catheter position.

angiographically in Fig. 2. Run-off was via the anterior tibial, peroneal and posterior tibial arteries. 3000 IU of heparin were given intra-arterially prior to entry into the subintimal space with a 0.035 guidewire and a 5F predilating catheter. The passage was easily formed past the occlusion (Fig. 3). However re-entry into the vessel lumen was not possible (Fig. 4). The procedure was therefore abandoned without balloon dilatation and with the intention of repeating the procedure at a later date. The patient was recalled after 2 months but on this occasion angiography revealed that the SFA was patent throughout its course (Fig. 5), although there were several significant stenoses identified. Good flow into the calf vessels was demonstrated (Fig. 6). The patient at this time described an improvement in symptoms and for this reason no further intervention was undertaken. At the 6-month follow-up, however, the symptoms had recurred with claudication once again at 400 yards. On clinical examination there were no palpable pulses below the right femoral artery, and the ABI was 0.6 at rest confirming the presence of

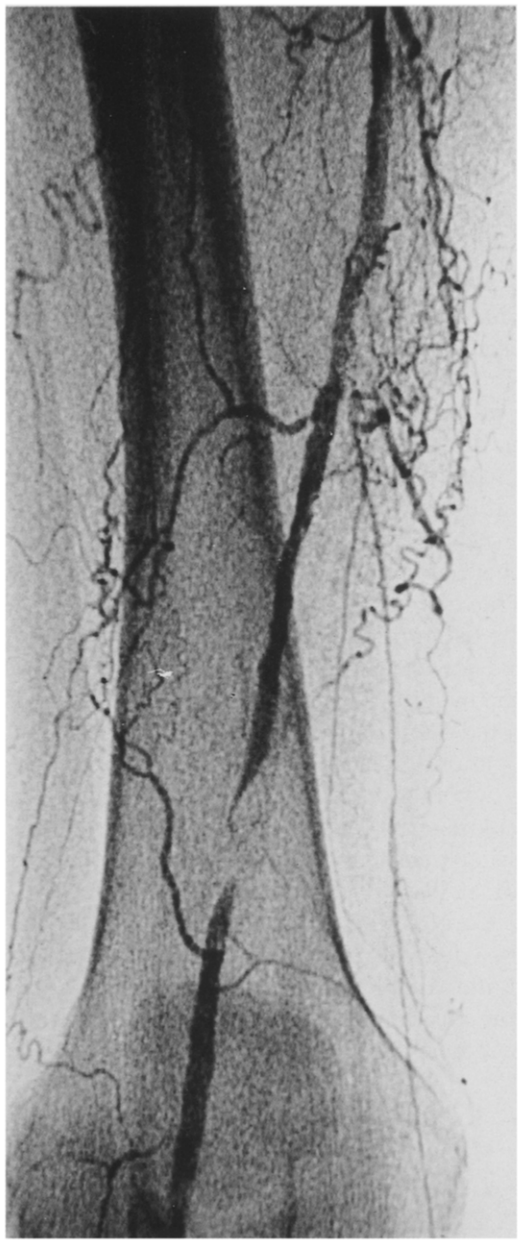

Fig. 4. Following failed re-entry into the vessel lumen contrast is seen to pass into the subintimal channel, which has been created several cm beyond the occluded segment, however refilling of the distal vessels is via the collaterals which have not been compromised by the procedure.

Fig. 5. Arteriogram performed 2 months following the original procedure shows good flow in a patent SFA.

significant disease. A duplex ultrasound was performed 4 months later which showed diffuse atheroma in the proximal SFA as before and a recurrent 8 cm occlusion in the thigh. All three crural vessels were patent, although the distal PT could not be seen due to heavy wall calcification.

Discussion

Subintimal angioplasty has been shown to be effective in the treatment of femoral and popliteal artery occlusions. Inadvertent entry into the subintimal space may often occur during percutaneous treatment of occlusions. Conventional teaching suggests that this is an indication to relocate the guidewire or even abandon the procedure in order to avoid distal dissection. Deliberate use of the subintimal passage is a

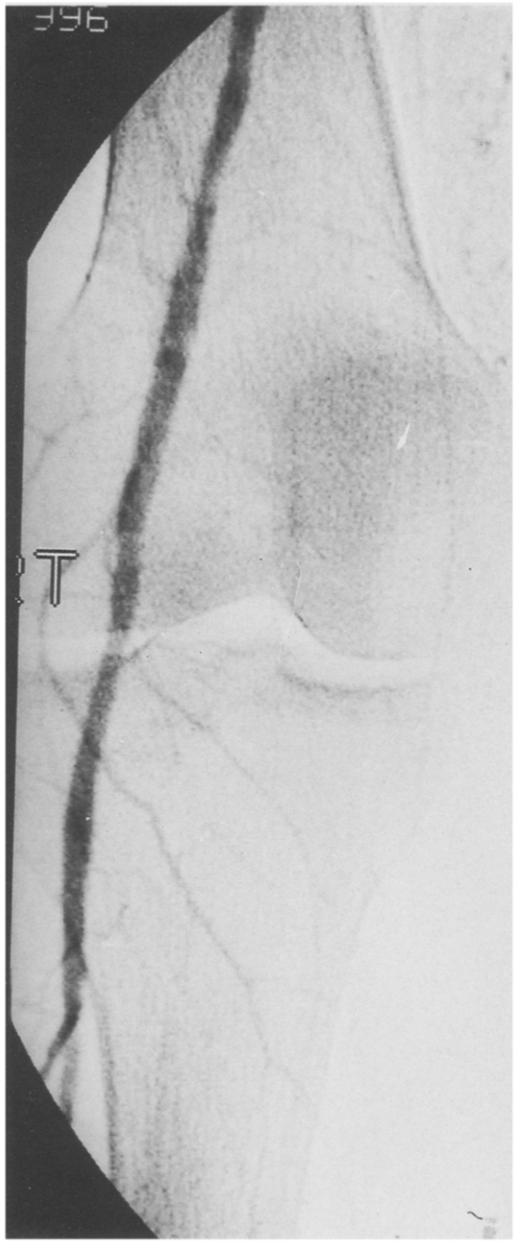

Fig. 6. Arteriogrm performed 2 months following the original procedure showing the popliteal artery and proximal crural vessels.

quick and usually successful method for recanalisation of even long occlusions in the femoropopliteal vessels[1,2] and more recently the technique has been successfully applied to iliac and crural vessel occlusion.[3] It is associated with a low incidence of complications.[1,2] Primary and 3-year patencies compare favourably with intraluminal reacanalisation techniques.[2] Difficulty in re-entering the true lumen with the guidewire is thought to be related to the degree of intimal thickening and calcification. Neither, however, is considered reason for not attempting the technique.

Re-entry of contrast from the subintimal space into the true lumen is often seen during subintimal angioplasty procedures even before a guidewire has been negotiated back through the intima. It is assumed that this occurs through small tears in the intima which form in a similar fashion to that which occurs when acute aortic dissections spontaneously re-enter the lumen. This mechanism is likely to be responsible for the outcomes in the cases described. Concerning case 2 the authors, in retrospect, suggest that at the time of the second angiogram, angioplasty of the stenosed SFA channel (Fig. 5) would have been desirable and might have prevented early reocclusion. It seems likely that the balloon angioplasty performed in case 1 contributed towards the successful outcome.

In the event of failure to re-enter the lumen during attempted subintimal angioplasty, patients should be closely monitored in the post-procedural period to assess whether emergency surgery is necessary to revascularise the limb. In those patients needing no immediate intervention, it is the practice of the authors to wait at least 8 weeks before reattempting angioplasty. Careful clinical examination prior to this may suggest a delayed procedural success and duplex ultrasound, if available, may be used to confirm a positive outcome. Readmission of the patient for repeat angiography could then be avoided.

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